



Diagnosis and Surgical Treatment of Carotid Body Tumors

Karotis Cisim Tümörlerinde Tanı ve Cerrahi Tedavi

Karotis Cisim Tümörleri / Carotid Body Tumors

Anıl Özen, Ertekin Utku Ünal, Emre Kubat, Başak Soran Türkcan, Bahadır Aytekin, Erman Kiriş, Ayşen Aksöyek, Cemal Levent Birincioğlu
Cardiovascular Surgery, Türkiye Yüksek İhtisas Hospital, Ankara, Türkiye

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Özet

Amaç: Glomus karotikum tümörleri boyun bölgesinin nadir görülen tümörlerindendir. Cerrahinin esas amacı tümörün eksize edilip çıkartılmasıdır. Bu çalışma; ameliyat edilen hastalardaki cerrahi strateji ve cerrahi sonuçlar üzerine odaklanmıştır. **Gereç ve Yöntem:** Hastanemizde; 2004-2013 yılları arasında; 10 hasta (ortalama yaş 49±9; 41-69 yaş arası) karotikum tümörü tanısı ile ameliyat edilmiştir. Tanı bilgisayarlı tomografi; manyetik rezonans görüntüleme veya Doppler ultrasonografiyi takiben yapılan dijital subtraction anjiyografi ile konulmuştur. Shamblyn sınıflandırmasına göre 2 hasta tip 3 ve 8 hasta da tip 2 olarak değerlendirilmiştir. **Bulgular:** Cerrahi sonrası mortalite gözlenmedi. Ameliyat sonrasında hastalarda nörolojik sekel görülmedi. Takip süresi 44.11±34.62 ay (dağılım 2-98 ay) olarak saptandı. Ses kısıklığı postoperatif dönemde bir hastada meydana gelmiş olup ameliyat sonrası 2. ayda kaybolmuştur. 2 hastada preoperatif dönemde mevcut olan dilde deviyasyon ve sağ gözdeki pitozis ameliyat sonrasında da devam etti. 1 hastada ses kısıklığı ve disfaji devam etti. 2 hasta tümör rekürensi nedeni ile tekrar ameliyat edildi. **Sonuç:** Glomus karotikum tümörlerinin tedavisinde en iyi yöntem cerrahidir. Arteriyel yapıların devamlılığının korunması ve cerrahi sırasında komşu vasküler ve sinir yapıların hasar görmemesi için azami dikkat gerekmektedir.

Anahtar Kelimeler

Karotis Cisim Tümörü; Paraganglioma; Glomus Karotikum Tümörü; Karotis Arteri

Abstract

Aim: Carotid body tumors are rare benign tumors of the neck. Excision of the tumor is the main goal of the surgical procedure. This study is focused on the surgical strategy and results of the patients who were operated for carotid body tumor. **Material and Method:** 10 patients with a mean age 49±9 years; ranging from 41-69 years with carotid body tumor underwent operation in our hospital between 2004-2013. Diagnosis was made using computerized tomography; magnetic resonance imaging or digital subtraction angiography after the initial doppler ultrasonography. According to Shamblyn classification; 2 patients have type 3 and 8 patients have type 2 carotid body tumors. **Results:** There was no postoperative mortality. There were no neurologic sequelae after the operation. The follow-up period was 44.11± 34.62 months (range 2-98 months). Hoarseness developed in one patient post-operatively and it disappeared 2 months after the operation. Two patients with deviation of the tongue and pytosis of the right eyelid had the same symptoms after the operation. In one patient; hoarseness and dysphagia had continued. Reoperations were done due to recurrence of the tumor in two (20%) patients. **Discussion:** Surgical excision is the best treatment modality for glomus caroticum tumors. Arterial continuity should be maintained and special attention should be made to avoid damaging adjacent vascular and neural structures during dissection.

Keywords

Carotid Body Tumor; Paraganglioma; Glomus Caroticum Tumor; Carotid Artery

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Corresponding Author: Ertekin Utku Ünal; Türkiye Yüksek İhtisas Hastanesi; Kalp-Damar Cerrahisi Kliniği; Sıhhiye; Ankara; Türkiye.

T.: +90 3123061714 F.: +90 3123124120 GSM: +905326570637 E-Mail: utkuunal@gmail.com

Introduction

Carotid body tumors are rare benign neoplasms originating from embryologic neural crest. They usually present with an asymptomatic mass in the neck. Surgical excision of these tumors is very difficult because of the close relationship with the arterial and neural structures.[1] Surgery plan is done according to Shamblin classification.[2] Excision of the tumor and reconstruction of the arterial structure if needed is the main goal of the surgical procedure. Especially in the type-3 cases; arterial continuity should be managed with graft interposition. In this study; surgical strategy and results of the patients who were operated for carotid body tumor were evaluated.

Material and Method

Ten patients (3 male and 7 female; mean age 49±9 years; range 41-69 years) with carotid body tumor were operated in our hospital between 2004-2013. This study complies with the Declaration of Helsinki and ethical approval was granted by the local institutional review board. Informed consent was obtained from all patients.

Only one patient had bilateral tumoral mass. Commonly; the main symptom was palpable mass in the neck. Dysphagia; hoarseness; syncope; deviation of the tongue and ptosis in the right eyelid were the other symptoms. There were no neurologic sequelae or complication except in the two patient with deviation of the tongue and ptosis in the right eyelid.

Common finding in the physical examination was the immobile; solid; rubbery pulsatile mass that is inferior to mandibular angle; just above the carotid artery in sizes between 2x3 cm to 4x4.5 cm. To confirm the diagnosis; we performed computerized tomography (CT); magnetic resonance imaging (MRI) or digital subtraction angiography (DSA) after the initial doppler ultrasonography (USG) (Figure 1). After these examinations; according to Shamblin classification; 2 patients have type 3; 8 patients have type 2 carotid body tumors.

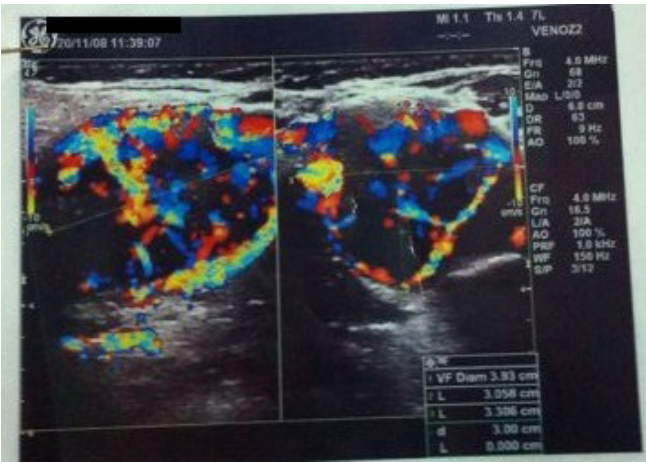


Figure 1. 4x3x3 cm sized glomus caroticum (heterogenic; hypoechoic) tumor located at the bifurcation of the external and internal carotid artery

Surgical Technique

All of the procedures were done under general anesthesia. 7-8 cm length incision was made parallel to the medial border of the sternocleidomastoid (SCM) muscle between the mandibular angle and medial border of clavicle. The carotid artery and its

branches were exposed and encircled with tapes. Distal arterial continuity was controlled in the cases requiring surgical resection of the arterial structures. Shunt was not used in any of the patients. External carotid artery (ECA) was ligated in 4 of 8 cases with type 2 tumor. Internal carotid artery (ICA) was reanastomosed to the common carotid artery (CCA) directly in 2 cases of type 3 tumor without any graft requirement. Balloon occlusion test was performed for these patients to evaluate the adequacy of the contralateral side.

Results

There was no mortality. There were no neurologic sequelae after the operation except the patients with preoperative neurologic deficits. The follow-up period was 44.11± 34.62 months (range 2-98 months). Hoarseness developed in one patient postoperatively and it disappeared 2 months after the operation. Two patients with deviation of the tongue and ptosis of the right eyelid had the same symptoms after the operation. In one patient; hoarseness and dysphagia had continued. Reoperations were done due to recurrence of the tumor in two (20%) patients. One of them came to the outpatient clinic due to swelling and underwent reoperation during the first postoperative year whilst the other one was diagnosed during the second postoperative year at the routine check up by doppler USG and underwent reoperation. The pathological examination of all the patients was reported as a glomus caroticum tumor revealing no malignancy.

Discussion

The average size of the carotid body tumors is 5x3x1;5 mm and the average weight is 12.1 mg (ranges from 1-47.4 mg).[1] Carotid body regulates the autonomic control of respiratory and cardiovascular system. Paraganglionic cells that are the constituent of this structure sense the blood pH; pO2 and pCO2 changes.[3] They are more common in women and in 10% of the patients are seen bilaterally.[4] Only 3-12.5% of them are malignant.[5] In our study; 7 (70%) were female and 3 (30%) were male and only one (10%) patient had bilateral tumoral mass.

Tumor diameter is important in appearance of the symptoms and planning of the treatment. These tumors are very vascular and have a dense capillary structure. Shamblin et al. [2] classified these tumors in three groups according to the invasion of the carotid artery. In type 1; there is minimal invasion of the internal carotid artery. Excision of this type can be done simply. In type 2; carotid arterial structures are partially invaded and dissection of the tumor is difficult. However; the tumor can be excised completely. Invasion of the arterial structures is very advanced in type 3 and tumor invades the arterial structures completely. Unfortunately; excision of the tumor from these structures is not possible.[6] Excision of such tumors has the potential risk for cranial nerve injury and massive hemorrhage. In Shamblin type 1 and 2 tumors; excision of the tumor is recommended with careful subadventitial dissection whereas in shamblin type 3 tumors; excision of the external and/or internal carotid artery is necessary. If the ICA is invaded by the tumor or damaged during the operation; reconstruction of the ICA is required. In our study; carotid body tumors were excised involving the ECA in type 3 cases and the ECA was reanastomosed to the common CCA directly without any graft requirement. Hemor-

rhage was controlled by the vascular clamps which were used in short intervals during the completion of the anastomosis. In type 2 cases tumor was excised in the subadventitial plan. There was reasonable hemorrhage and hence no need for CCA clamping.

Another problem in the excision of the tumor is massive hemorrhage during the operation. We start the dissection of the tumor at the CCA and advance distally towards the ECA applying multiple clamps along the way to minimize bleeding. This way; we reach the ECA and we are able to excise the tumor at the level of the ECA (Figure 2). This reduces the blood supply of the tu-

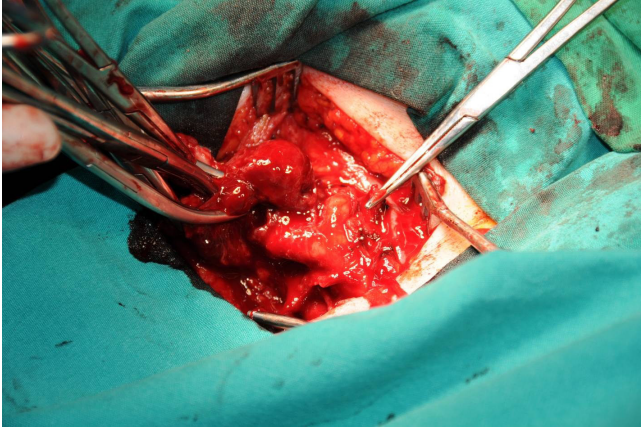


Figure 2. Tumor excised and detached from the ECA applying multiple clamps

mor since 70-80% of its blood supply originates from the ECA. With the modern surgical techniques; stroke risk is less than 5% in the surgical excision of the carotid artery tumors.[7] Cranial nerve injury was reported as 32-44% postoperatively in the literature.[8] 20% of the patients have permanent neurological deficit. 2 (20%) of our patients had preoperative neurological deficit which continued on postoperatively. None of our patients developed new onset neurological deficit. In one patient; hoarseness that developed postoperatively disappeared in the second postoperative month whilst in the other one hoarseness and dysphagia continued. Surgical manipulation and edema were the possible causes of this situation.

Surgical outcomes are related to tumor size and invasion rate. Surgery should be performed as soon as possible at the time of diagnosis because of the growth rate potential and local invasion in patients with a long survival expectation.[9]

Surgical excision is the best treatment modality for glomus caroticum tumors. Arterial continuity should be maintained and special attention should be made to avoid damaging adjacent vascular and neural structures during dissection.

Competing interests

The authors declare that they have no competing interests.

References

1. Mataracı İ, Rabuş MB, Kırallı K, Kıran B, Yanartaş M, Sunar H ve ark. Karotis cisim tümörlerinin tanı ve cerrahi tedavisi. *Türk Göğüs Kalp Damar Cer Derg* 2008;16(2):86-90.
2. Shamblyn WR, Re Mine WH, Sheps SG, Harrison EG. Carotid body tumor (chemodectoma). Clinicopathologic analysis of ninety cases. *Am J Surg* 1971;122:732-9.
3. Baysal BE, Myers EN. Etiopathogenesis and clinical presentation of carotid body tumors. *Microsc Res Tech* 2002;59:256-61.

4. Ridge BA, Brewster DC, Darling RC, Cambria RP, LaMuraglia GM, Abbott WM. Familial carotid body tumors: incidence and implications. *Ann Vasc Surg* 1993;7:190-4.
5. Rodríguez-Cuevas S, López-Garza J, Labastida-Almendaro S. Carotid body tumors in inhabitants of altitudes higher than 2000 meters above sea level. *Head Neck* 1998;20:374-8.
6. Kunt A, Bulut F, Demir CS. Karotis cisim tümörleri. *Türk Göğüs Kalp Damar Cer Derg* 2003;11:198-200.
7. Hallett JW Jr, Nora JD, Hollier LH, Cherry KJ Jr, Pairlero PC. Trends in neurovascular complications of surgical management for carotid body and cervical paragangliomas: a fifty-year experience with 153 tumors. *J Vasc Surg* 1988;7:284-91.
8. Persky MS, Setton A, Yasunari N, Hartman J, Frank D, Berenstein A. Combined endovascular and surgical treatment of head and neck paragangliomas: a team approach. *Head Neck* 2002;24:423-31.
9. Amoto B, Bianco T, Compagna R, Siano M, Esposito G, Buffone G, Serra R et al. Surgical resection of carotid body paragangliomas. *Am J Surg* 2013; doi: 10.1016/j.amjsurg.2013.06.002.

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